

# Speed Of Light

Electrical and communication systems are advancing so rapidly it's hard for code to keep up

by NATALIE BRUCKNER

**E**lectrical and communication systems are advancing at a rapid rate. While the sector faces its challenges as code requirements try to keep up, leaders in the industry are forging ahead and working on some very exciting projects.

The adoption of energy efficient technologies such as LED lighting, lighting controls, heat recovery, and green power has become the norm these days, and so increasing attention is being paid to integration, accessibility, and control.

"With LED lighting and digital lighting control systems we can both save energy with daylight and occupancy sensing, while also allowing users to easily dim their fixtures to their preferred light level. Further, with tunable white LEDs we can control the lighting to match our natural circadian rhythms, allowing for better functioning both at work and when we go to sleep," says Ben Rajewski at Williams Engineering.

Rajewski adds that control has expanded not just with lighting but with technologies in meeting spaces. "Meeting rooms have become highly intelligent with video conferencing, touchscreen monitors, and dynamic sound systems all being easily user controlled. Smartphone integration into both lighting and AV controls makes these systems easily accessible to anyone without additional hardware. The costs for these systems are much less prohibitive than years past so they are available to most users now."

Williams is currently working on the electrical and communication systems upgrades of several historical buildings. The iconic Muttart Conservatory in Edmonton being one example. It was constructed in 1976 and has not upgraded much of its electrical distribution since that time. "Working within the constraints of the existing structure [glass pyramids] has been challenging, including running power from a new utility transformer into the centre of an existing building, but I am confident we will succeed," says Rajewski.

Williams is also working on the expansion of the historic Selkirk Hotel within the existing Fort Edmonton Heritage Park. The electrical design needs to meet both modern energy efficiency and technological requirements, while still working within the historical 1920s' context. "This will include LED lighting set within historical fixtures and digital lighting controls set in locations that are unobtrusive to the space. The goal will be for guests to feel immersed in the 1920s while maintaining the 2020s' conveniences," says Rajewski.

While the high payback periods of some of the energy efficient technologies is still a roadblock, Rajewski adds that there are numerous exciting developments happening in the sector, including the implementation of electric vehicle (EV) charging stations, which can be a challenge, depending on the load capacity of the existing building infrastructure.

Steve Nemetz at Nemetz (S/A) & Associates agrees that EV charging stations are a challenge, especially with many local municipalities requiring 100 percent of residential stalls be complete with an energized EV charging outlets. "We need to provide an EV management system [or provision] so that the overall electric load in a building doesn't greatly increase due to this 100 percent Residential EV Stall requirement."

Another topic that is often talked about in the sector is the so-called smart buildings that feature integrated systems. However, Nemetz says he has yet to see a really good working model in the industry and that his company continues to search for examples that demonstrate this.

Of course the sector, like any other, faces its challenges and Nemetz cites the wide gap between Code Calculated Loads and actual usage of electricity as one example. "This can only be overcome by working with the local authorities who are responsible for determining the electrical code requirements. Communications challenges always relate to keeping up with the changing technology; and allowing enough infrastructure for the changes," he says.

Nemetz is excited to be working on some mixed-use developments where shopping centres are being upgraded and converted to residential, commercial, office, and institutional developments. "In these projects the electrical and communications are intricate as they need to service each components requirements, while being integrated into the overall development."

Bridge Electric Corporation continues to provide ongoing training to ensure its team is up-to-date on the latest codes, practices, and technologies.

One project of note that Bridge Electric worked on that showcases the best practices in integration and

green building design is the 29-storey Metrotower III office building. In addition to the use of high-efficiency LED light fixtures throughout the project, multiple electrical energy conservation methods were employed to maximize efficiency such as perimeter daylight harvesting, vacancy sensors, and receptacle load control in both open and closed office spaces.

Another project that Bridge Electric worked on that demonstrates how technology is advancing in the electrical and communications sector is the CBSA FS0LSI Facility in Surrey, B.C. Utilizing CAD and 3D computer modelling software, Bridge Electric worked closely with Scott Construction and the scanning equipment provider to make sure the electrical systems would integrate with the sophisticated equipment and meet the end user's needs.

Monitoring and testing continue to play an essential role in the sector, and, according to Randy Noble, senior construction division manager at Houle, with all projects now requiring an arc flash study (the evaluation of a workplace facility by an electrical safety expert), this often results in identifying co-ordination issues with older switchgear. "The resulting essential upgrades mean renovation

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budgets have to be stretched even further. Engineers also face big challenges in trying to marry together the constantly changing requirements of many separate codes. It is time to amalgamate ASHRAE, CEC, NBC, Fire codes, and CSA to put them on the same schedule for updates," advises Noble.

He adds that current ASHRAE regulations also overlook the fact that not all offices are created equal. "We had a recent project complete where the controlled receptacles were powering computers completing a scientific experiment that ran for 40 hours uninterrupted. Unfortunately the data was corrupted when the computers began shutting down in the evening. Customer education about how their workspaces have been designed and the ability to give customers the power to control settings is paramount for the future," he adds.

Houle is well known for working on some fascinating projects, and its recent installations at the Esquimalt Graving Dock is one example. Houle installed computer controlled and monitored switchgear to give the customer greater visibility and a much safer work environment by allowing breaker operation from remote locations on the site.

Integration, as previously mentioned, remains a big focus in the sector, and Nuno Antunes, audio visual account manager at Houle, says that over the past few months he has met with a few developers who are wanting assistance/solutions for a scalable/future-proof infrastructure and integration solutions to differentiate their projects in the market.

However Noble warns that proprietary systems can inhibit cross platform communication and the

resultant functionality continues to make integration difficult, short-changing the end user of the advantages of integrated systems. "Manufacturers need to come to an agreement on communication protocols for advancements to be truly utilized to their maximum advantage."

WSP is well known for providing future-ready technical expertise and strategic advice on electrical and communication systems, and Victor Wong, director of the electrical, SCADA and facilities group at WSP, says that with greater collaboration between municipalities, ideas such as MESH communication network technologies (rather than the traditional wireless technology) could become a viable option.

Mesh Networks are considered more reliable, because if one node in a mesh network fails, communication can be re-routed to improve reliability. Devices can also communicate directly with each other. Wong says that another option for a Smart City strategy would be "building out microcells for 5G networks."

An exciting development of late for WSP is the flywheel energy storage and power generation system that WSP designed for Vancouver International Airport (YVR). While YVR's lighting system has been updated to new energy efficient LED-style lights, the existing electrical back-up power system was aged and in need of replacement. WSP evaluated a range of design options and technologies with YVR to determine the most suitable design to meet the project objectives.

David Kelly and his team designed a flywheel energy storage and power generation system to solve these problems. This system consists of two 600 kW redundant high-efficiency diesel generators, an intelligent

power switchgear distribution system, and a 625 kVA flywheel uninterruptible power supply (UPS) system.

The innovative solution of using a Flywheel UPS system to provide large-scale uninterrupted power during a power outage while the backup generators start up was key, as it allowed significant flexibility in how the generators are operated.

Looking ahead, Richard Harper, practice leader, Infrastructure BC for WSP, says he expects to see significant expansion of the electrical grid to meet climate targets. "Greenhouse gas reduction will be a key driver of the economy out to 2050," he adds.

IESO continues to work closely with a number of building owners and residential property management companies in Toronto that are focussed on the latest in electrical systems.

Suneel Gupta, director, energy and sustainability at FirstService Residential, has a portfolio of 350 condominium communities in Toronto. He says because utilities represent 30 percent or more of a condo's annual budget, energy management for electrical systems helps control annual maintenance fee increases. "The process of energy management can also help manage pre-mature equipment failure/repair – which helps minimize disruption of heating/cooling."

As for trends, he is seeing LED lighting and light occupancy/motion detection in corridors, parking, storage lockers, stairwells becoming commonplace, as well as smarter chiller designs, suite ventilation (versus corridor ventilation) with energy recovery devices (estimated at five to 10 percent of new buildings), improved building automation systems and electric vehicle charging stations. **A**

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